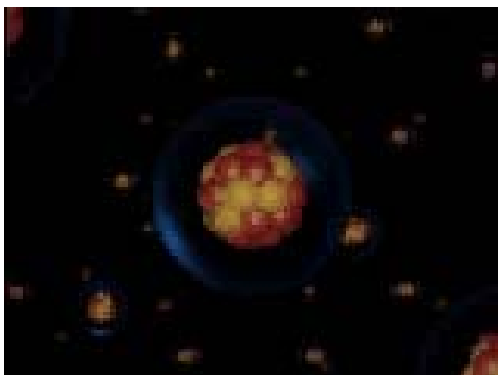




Cross-sections

Fission Products & Yields



nuclides.net **²³⁵U** **Fission Products**

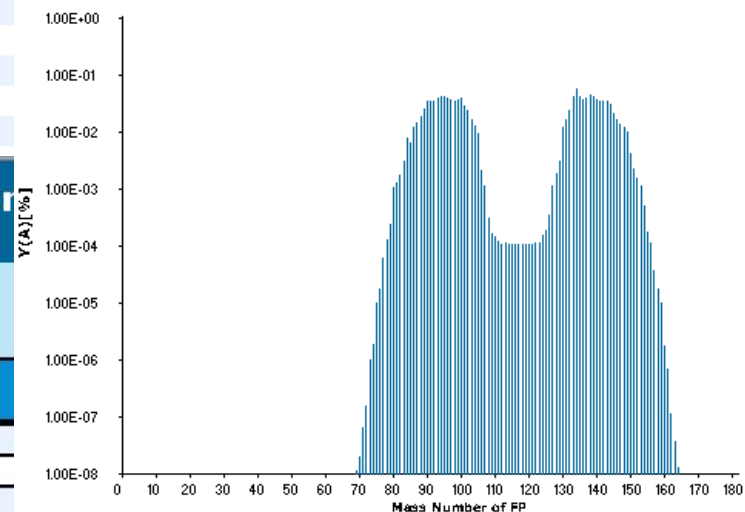
Library: **ENDF** Excitation Energy: **Thermal** **Start**

Nuclide ▲	Half-life	IND	ERROR	CUMUL	ERROR
25 Mn 66	2.20E-01	7.20E-12	4.61E-12	7.22E-12	4.62E-12
25 Mn 67	1.50E-07	5.38E-12	3.44E-12	5.38E-12	3.44E-12
26 Fe 66	6.00E-01	3.76E-10	2.41E-10	3.83E-10	2.45E-10
26 Fe 67	5.00E-01	6.87E-10	4.40E-10	6.92E-10	4.43E-10
26 Fe 68	1.00E-01				
26 Fe 69	9.00E-02				
27 Co 66	2.30E-01				
27 Co 67	3.20E-01				
27 Co 68	3.10E-01				

nuclides.net **²³⁵U** **Average Cross-sections**

Library: **JENDL-3.2** ☐ Open in new window

Reaction	2200-m/s (barns)	Maxw.Avg. (barns)	Res.Intef (barns)
total	698.3	608.4	556.3
elastic	15.06	14.97	152.9
inelastic	-	-	0.1549
n,2n	-	-	-
n,3n	-	-	-
n,g	98.83	86.66	132.4
n,fission	584.4	506.8	270.9





Nuclear cross-section

- When bombarding a target nucleus , no guarantee that the projectile will interact with to bring a given reaction

$$-\frac{d\phi}{dt} = \sigma N \phi \quad \text{where } \phi \text{ flux of projectiles}$$

N number of atoms per unit volume

σ constant of proportionality: **cross section**

- Cross section unit: $1\text{b} = 10^{-24} \text{ cm}^2$



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Cross section data on Nuclides.net

nuclides.net **²³⁵U** Average Cross-Section Data

Library: JEF-2.2 ☐ Open in new window

Reaction

total
elastic
inelastic
n,2n
n,3n
n,g
n,fission

Averaged Cross-Section Data - Microsoft Internet Explorer

nuclides.net **²³⁵U** Average Cross-Section Data

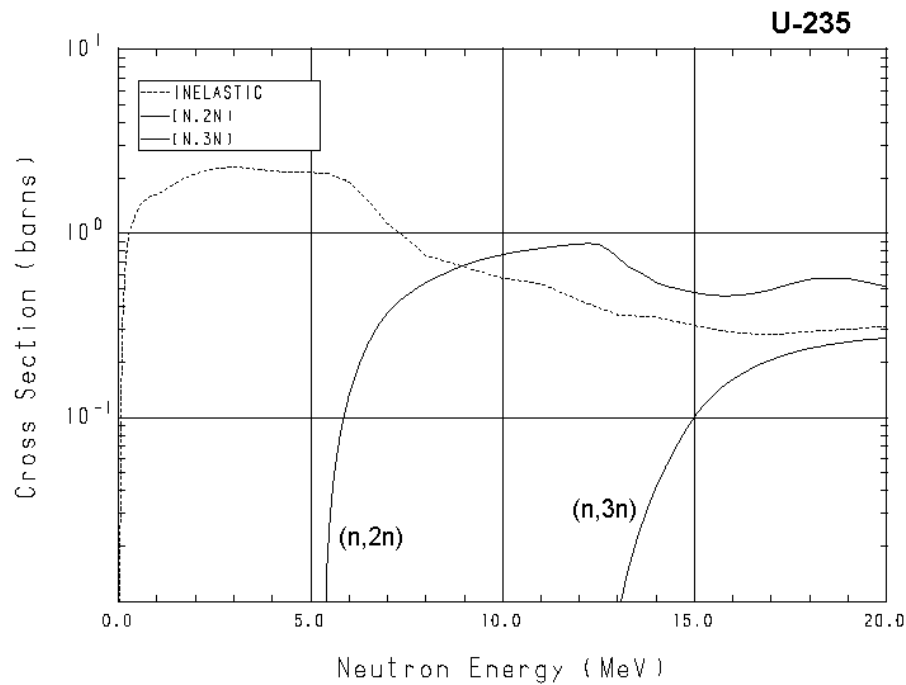
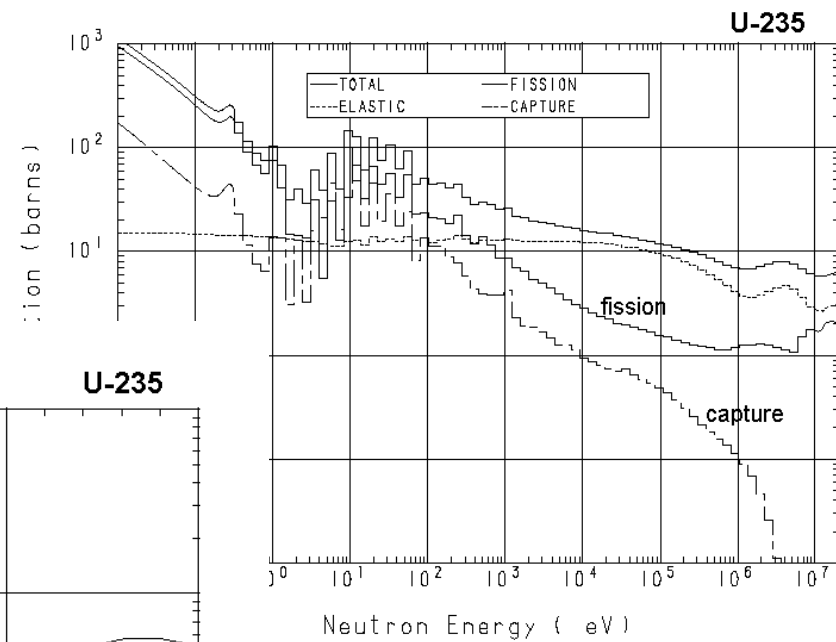
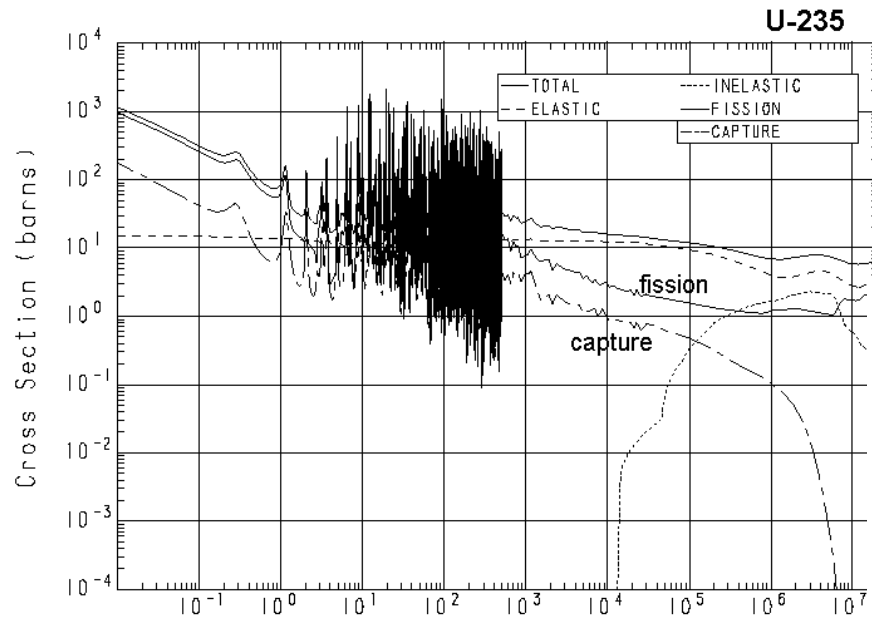
Library: JENDL-3.2

Reaction	2200-m/s (barns)	Maxw.Avg. (barns)	Res.Intef (barns)	14-MeV (barns)	Fiss.Avg. (barns)
total	698.3	608.4	556.3	5.865	7.722
elastic	15.06	14.97	152.9	2.869	4.595
inelastic	-	-	0.1549	0.3503	1.785
n,2n	-	-	-	0.5429	0.01348
n,3n	-	-	-	0.04179	0.00001649
n,g	98.83	86.66	132.4	0.0000001607	0.09169
n,fission	584.4	506.8	270.9	2.054	1.237

Joint

nuclides.net

section diagrams

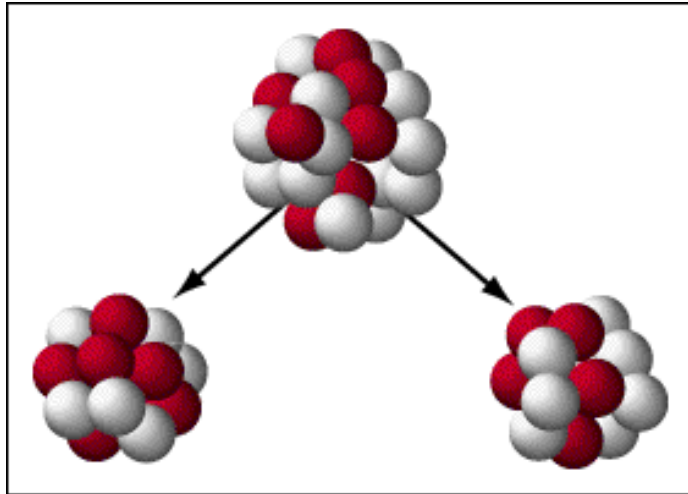


2

cross-sections



Spontaneous fission

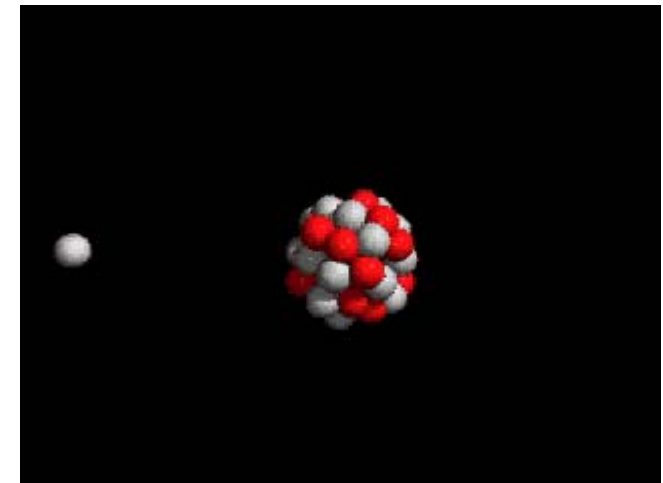
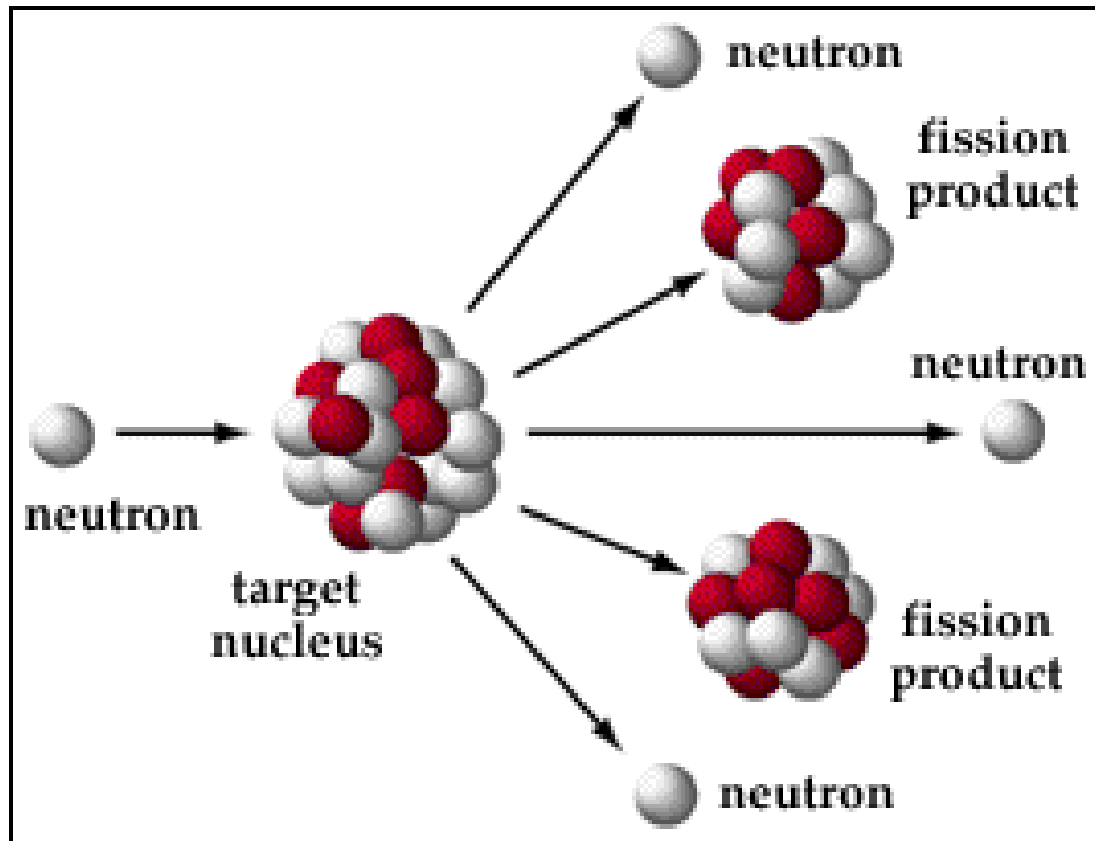


When the atom fissions spontaneously without an external intervention

- Quantum mechanics allows, with low probability, the “tunnel effect” within the liquid drop model
- The spontaneous fission for heavy nucleus occurs slowly
- ex: ^{252}Cf

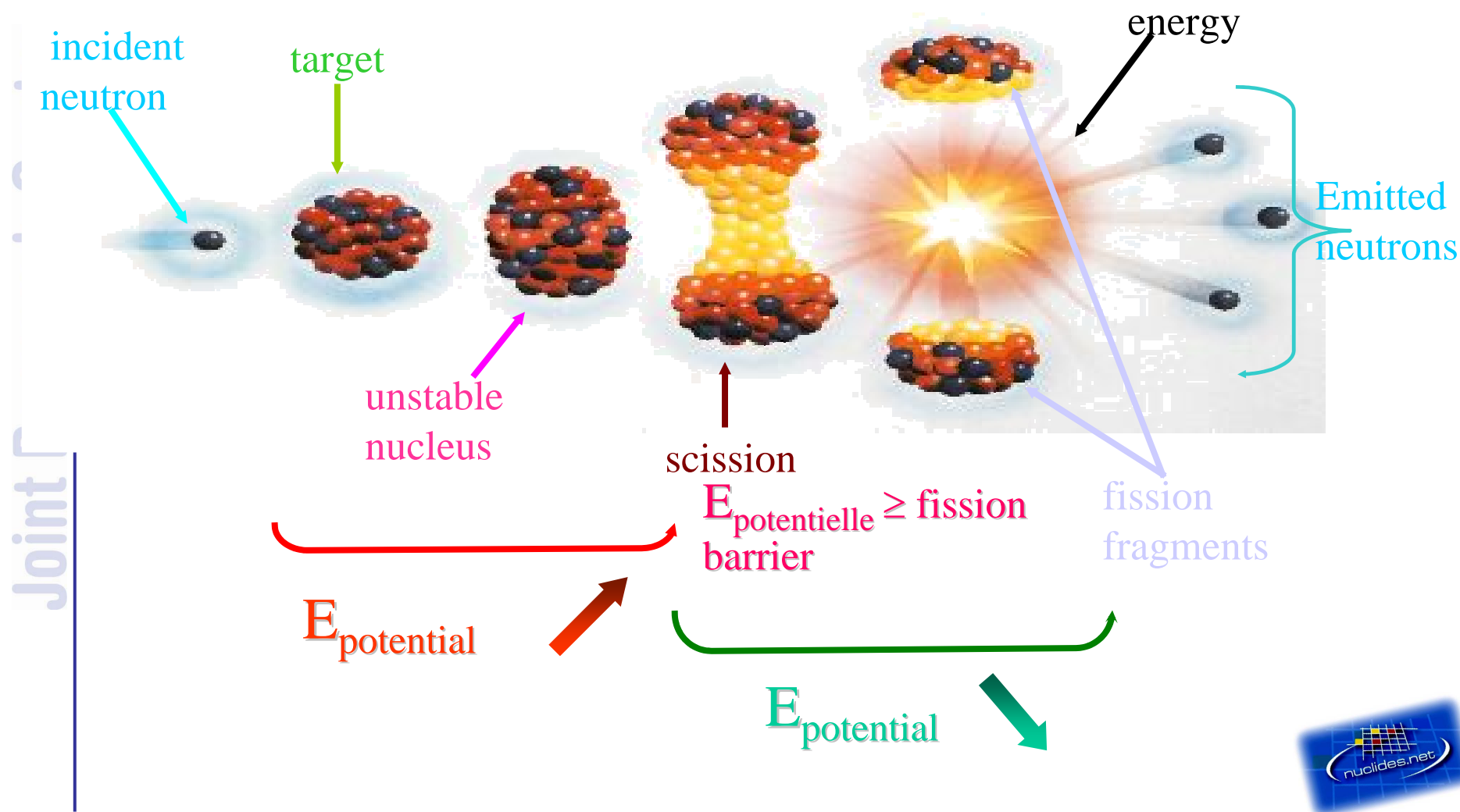


The n-induced fission process





Details of the n-induced fission





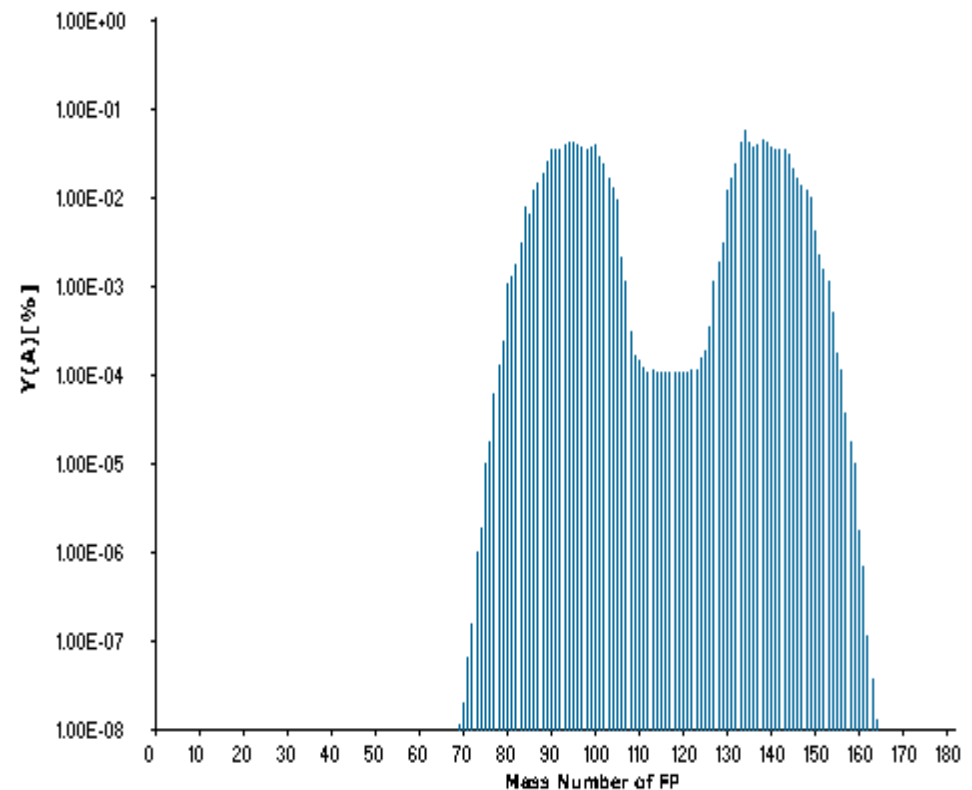
Fission yields

- **Independent yield:** number of atoms of a specified nuclide produced directly (after emission of prompt neutrons but excluding radioactive decay) per fission
- **Cumulative yield:** number of atoms of a specific nuclide produced directly and via decay of precursors per fission
- **Chain yield:** number of isobars of specific mass produced per fission



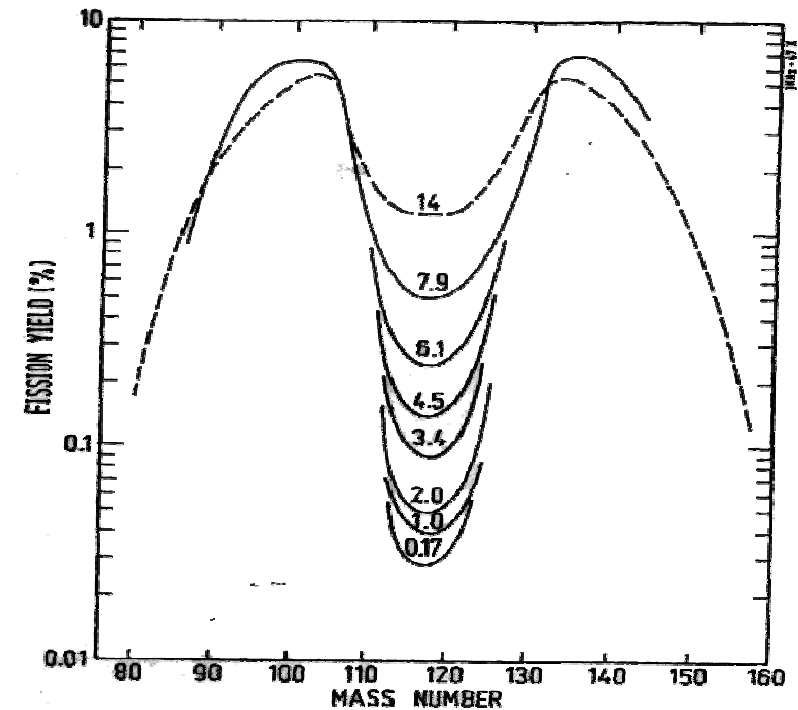
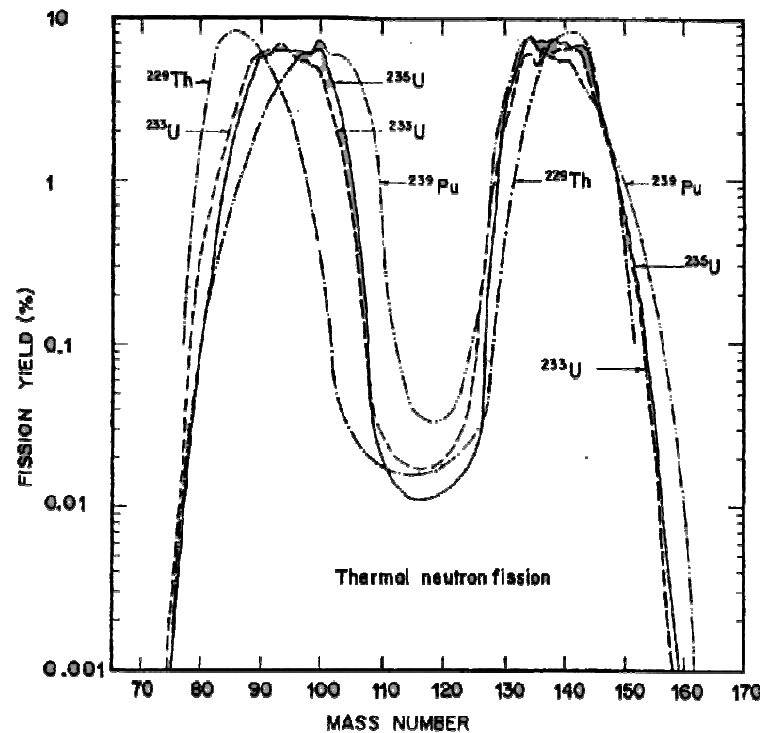
Fission products

- Asymmetrical fission
- Isotopes of more than 30 elements are observed as fission products
- Most of the fragments are far from the stability and then decay by β^- or delayed neutron





Dependence of the FY distribution in n-energy and target nature





Fission yields data in Nuclides.net

